

Appl. No. 10/046,594
Amdt. dated January 10, 2008
Reply to Office action of July 10, 2007

This listing of claims will replace all prior versions, and listings, of claims in the application;

Listing of Claims:

1. (Previously Presented) A lithographic method for forming a pattern in a film carried on a substrate, comprising the steps of:
 - providing a mold comprising a protruding feature and a recessed feature formed thereby, the protruding feature and the recessed feature having a shape forming a mold pattern and providing at least one feature with a lateral dimension of 100 nm or less;
 - depositing a film on a substrate;
 - urging the mold into the film whereby the thickness of the film under the protruding feature is reduced and a thin region is formed in the film;
 - removing the mold from the film; and
 - processing the film whereby the thin region is removed exposing a portion of the surface of the substrate which underlies the thin region,
 - whereby the exposed portion of the surface of the substrate substantially replicates the mold pattern thereby forming a pattern in the film having at least one feature with a lateral dimension of 100 nm or less, and
 - wherein at least a portion of said protruding feature and a portion of said recessed feature have bonded thereto a release material comprising an inorganic linking group bonded to a molecular chain having release properties.
- 2.-41. (Cancelled).

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42. (Previously Presented) The method of claim 1 wherein the film comprises a material that passes from a flowing state to a non-flowing state during the molding process.

43. (Previously Presented) The method of claim 42 wherein the film comprises a thermoplastic, hardenable or curable material.

44. (Previously Presented) The method of claim 42 wherein the material passes from a flowing state to a non-flowing state upon change of temperature, pressure, polymerization, irradiation or charging.

45. (Previously Presented) The method of claim 1 wherein the film comprises a film layer selected from the group consisting of: polymer film, latex film, viscous polymer coating, composite coating, fusible powder coating, adherent powder coating or fusible powder coating.

46. (Previously Presented) The method of claim 1 wherein the film comprises a moldable polymer.

47. (Previously Presented) The method of claim 1 wherein the film comprises a moldable polymer selected from the group consisting of: acrylates, methacrylates, polycarbonates, polyvinyl resins, polyimides, polyurethanes, polysiloxanes, polyesters and polyethers.

48. (Previously Presented) The method of claim 1 wherein the film comprises metal oxides, metal halides, semimetal oxides or semimetal halides.

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49. (Previously Presented) The method of claim 48 wherein the film is a sol.

50. (Previously Presented) The method of claim 1 wherein the film comprises microfibers.

51. (Previously Presented) The method of claim 1 wherein the film comprises a multilayer of films.

52. (Previously Presented) The method of claim 1 wherein the substrate comprises a semiconductor, insulator or metal.

53. (Previously Presented) The method of claim 1 wherein the substrate comprises a single crystal material.

54. (Currently Amended) The method of claim 1 wherein the substrate comprises an amorphous material.

55. (Previously Presented) The method of claim 1 where the substrate comprises a composite material.

56. (Previously Presented) The method of claim 1 where the substrate comprises a multilayer substrate.

57. (Cancelled)

58. (Cancelled)

59. (Previously Presented) The method of claim 51 wherein the pattern formed in one layer of the multilayer of films is used as a mask to pattern the underlying layers in the multilayer.

60. (Currently Amended) The method of claim 59, wherein the pattern in the mask is used to pattern more than one layer of the multilayer of films.

61. (Previously Presented) The method of claim 1, wherein the pattern formed in the film has at least one feature with a lateral dimension of 70 nm or less.

62. (Previously Presented) The method of claim 1, wherein the pattern formed in the film has at least one feature with a lateral dimension of 50 nm or less.

63. (Previously Presented) The method of claim 1, wherein the pattern formed in the film has at least one feature with a lateral dimension of 25 nm or less.

64. (Currently Amended) A lithographic method for forming a pattern in a film carried on a substrate, comprising the steps of:

providing a mold comprising a protruding feature and a recessed feature formed thereby, the protruding feature and the recessed feature having a shape forming a mold pattern;

depositing a film on a substrate, wherein the film comprises a material that is substantially insoluble in organic liquids;

urging the mold into the film whereby the thickness of the film under the protruding feature is reduced and a thin region is formed in the film;

removing the mold from the film; and

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processing the film whereby the thin region is removed to form a resist pattern
exposing a portion of the surface of the substrate which underlies the thin region

whereby the exposed portion of the surface of the substrate substantially
replicates the mold pattern, and

wherein at least a portion of said protruding feature and a portion of said
recessed feature have bonded thereto a release material comprising an inorganic
linking group bonded to a molecular chain having release properties.

65. (Previously Presented) The method of claim 64, wherein the film
comprises a hardenable or curable material.

66. (Previously Presented) The method of claim 64, wherein the film
comprises a film layer selected from the group consisting of: polymer film, latex
film, viscous polymer coating, composite coating, fusible powder coating, adherent
powder coating or fusible powder coating.

67. (Previously Presented) The method of claim 64, wherein the film
comprises a moldable polymer.

68. (Previously Presented) The method of claim 64, wherein the film
comprises a moldable polymer selected from the group consisting of: acrylates,
methacrylates, polycarbonates, polyvinyl resins, polyimides, polyurethanes,
polysiloxanes, polyesters and polyesters.

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69. (Previously Presented) The method of claim 64, wherein the film comprises metal oxides, metal halides, semimetal oxides or semimetal halides.

70. (Previously Presented) The method of claim 68, wherein the film is a sol.

71. (Previously Presented) The method of claim 64, wherein the film comprises microfibers.

72. (Previously Presented) The method of claim 64, wherein the film comprises a multilayer of films.

73. (Previously Presented) The method of claim 64, wherein the substrate comprises a semiconductor, insulator or metal.

74. (Previously Presented) The method of claim 64, wherein the substrate comprises a single crystal material.

75. (Previously Presented) The method of claim 64 wherein the substrate comprises an amorphous material.

76. (Previously Amended) The method of claim 64, wherein the substrate comprises a composite material.

77. (Previously Presented) The method of claim 64, wherein the substrate comprises a multilayer substrate.

78. (Previously Presented) The method of claim 72, wherein the pattern formed in one layer of the multilayer of films is used as a mask to pattern the underlying layers in the multilayer.

79. (Currently Amended) The method of claim 78, wherein the pattern in the mask is used to pattern more than one layer of the multilayer of films.

80. (Previously Presented) The method of claim 64, wherein the pattern formed in the film has at least one feature with a lateral dimension of 100 nm or less.

81. (Previously Presented) The method of claim 64, wherein the pattern formed in the film has at least one feature with a lateral dimension of 70 nm or less.

82. (Previously Presented) The method of claim 64, wherein the pattern formed in the film has at least one feature with a lateral dimension of 50 nm or less.

83. (Previously Presented) The method of claim 64, wherein the pattern formed in the film has at least one feature with a lateral dimension of 25 nm or less.

84. (Previously Presented) A lithographic method for forming a pattern in a film carried on a substrate, comprising the steps of:

providing a mold comprising a protruding feature and a recessed feature formed thereby, the protruding feature and the recessed feature having a shape forming a mold pattern;

depositing a film on a substrate; wherein the film comprises a multilayer film;

urging the mold into the film whereby the thickness of the film under the protruding feature is reduced and a thin region is formed in the film;

removing the mold from the film; and

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processing the film whereby the thin region is removed exposing a portion of the surface of the substrate which underlies the thin region

whereby the exposed portion of the surface of the substrate substantially replicates the mold pattern, and

wherein at least a portion of said protruding feature and a portion of said recessed feature have bonded thereto a release material comprising an inorganic linking group bonded to a molecular chain having release properties.

85. (Previously Presented) The method of claim 84, wherein the film comprises a thermoplastic, hardenable or curable material

86. (Currently Amended) The method of claim 84, wherein the film comprises a film layer selected from the group consisting of: polymer film, latex film, viscous polymer coating, composite coating, fusible powder coating, adherent powder coating ~~or~~ and fusible powder coating.

87. (Previously Presented) The method of claim 84, wherein the film comprises a moldable polymer.

88. (Previously Presented) The method of claim 84, wherein the film comprises a moldable polymer selected from the group consisting of: acrylates, methacrylates, polycarbonates, polyvinyl resins, polyimides, polyurethanes, polysiloxanes, polyesters and polyethers.

89. (Previously Presented) The method of claim 84, wherein the film comprises metal oxides, metal halides, semimetal oxides or semimetal halides.

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90. (Previously Presented) The method of claim 84, wherein the film is a sol.
91. (Previously Presented) The method of claim 84, wherein the film comprises microfibers.
92. (Previously Presented) The method of claim 84, wherein the substrate comprises a semiconductor, insulator or metal.
93. (Previously Presented) The method of claim 84, wherein the substrate comprises a single crystal material.
94. (Previously Presented) The method of claim 84, wherein the substrate comprises an amorphous material.
95. (Previously Presented) The method of claim 84, wherein the substrate comprises a composite material.
96. (Previously Presented) The method of claim 84, wherein the substrate comprises a multilayer substrate.
97. (Previously Presented) The method of claim 84, wherein the pattern formed in one layer of the multilayer of films is used as a mask to pattern the underlying layers in the multilayer.
98. (Currently Amended) The method of claim 97, wherein the pattern in the mask is used to pattern more than one layer of the multilayer of films.
99. (Previously Presented) The method of claim 84, wherein the pattern formed in the film has at least one feature with a lateral dimension of 100 nm or less.

100. (Previously Presented) The method of claim 84, wherein the pattern formed in the film has at least one feature with a lateral dimension of 70 nm or less.

101. (Previously Presented) The method of claim 84, wherein the pattern formed in the film has at least one feature with a lateral dimension of 50 nm or less.

102. (Previously Presented) The method of claim 84, wherein the pattern formed in the film has at least one feature with a lateral dimension of 25 nm or less.

103. (Previously Presented) A lithographic method for forming a pattern in a film carried on a substrate, comprising the steps of:

obtaining a substrate;

depositing a film on the substrate;

obtaining a mold of a stiff material which is hard relative to the film, the mold comprising a first protruding feature and a recess formed thereby and a second protruding feature spaced apart from the first protruding feature, the first and second protruding features and the recess having a shape forming a mold pattern and providing at least one mold pattern lateral dimension of 150 nm or less, wherein at least a portion of said protruding features and a portion of said recess have bonded thereto a release material comprising an inorganic linking group bonded to a molecular chain having release properties;

urging the mold at a molding pressure into the film whereby the thickness of the film under the protruding feature is reduced and a thin region is formed in the film, wherein the molding pressure is sufficiently high to transfer the mold pattern to the film

and the molding pressure causes a local deformation in the mold which is less than the mold pattern lateral dimension;

removing the mold from the film;

processing the relief whereby the thin region is removed exposing portions of the surface of the substrate which underlie the thin region; and

whereby the exposed portions of the surface of the substrate substantially replicate the mold pattern, including replication of at least one mold pattern with a lateral dimension of 150 nm or less.

104. (Previously Presented) A method for forming a pattern in a film carried on a substrate, comprising the steps of:

depositing a film on a substrate;

obtaining a mold comprising a protruding feature and a recess formed thereby, the protruding feature and the recess having a shape forming a mold pattern wherein at least one mold pattern lateral dimension is 125 nm or less, wherein at least a portion of said protruding feature and a portion of said recess have bonded thereto a release material comprising an inorganic linking group bonded to a molecular chain having release properties;

urging the mold into the film whereby the thickness of the film under the protruding feature is reduced and a thin region is formed in the film;

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removing the mold from the film, the film retaining a relief image thereon from the mold;

processing the relief image whereby the thin region is removed exposing a portion of the surface of the substrate which underlies the thin region; and

whereby the exposed portion of the surface of the substrate substantially replicates the mold pattern, including replication of at least one mold pattern with a lateral dimension of 125 nm or less.

105. (Previously Presented) A method for forming a pattern in a film, comprising imprinting a mold pattern comprising a first protruding feature, a recess, a second protruding feature, and a release material into the film, wherein the mold pattern comprises a lateral dimension of 150 nm or less.

106. (Previously Presented) The method of claim 105, wherein the film is coated on a substrate further comprising:

removing the mold from the film; and

processing the imprinted film to expose portions of the surface of the substrate;

whereby the exposed portions of the surface of the substrate substantially replicate the mold pattern, including replication of at least one mold pattern with a lateral dimension of 150 nm or less.

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107. (Previously Presented) The method of claim 105, wherein the release material comprises an inorganic linking group bonded to a molecular chain having release properties.

108. (Previously Presented) A method for forming a pattern in a film, comprising imprinting a mold pattern comprising a first protruding feature, a recess, and a release material into the film, wherein the mold pattern comprises a lateral dimension of 125 nm or less.

109. (Previously Presented) The method of claim 108 further comprising: removing the mold from the film; and

processing the film to expose portions of the surface of the substrate; whereby the exposed portions of the surface of the substrate substantially replicate the mold pattern, including replication of at least one mold pattern with a lateral dimension of 125 nm or less.

110. (Previously Presented) The method of claim 108, wherein the release material comprises an inorganic linking group bonded to a molecular chain having release properties.